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1876

REPORT
OF THE
BOARD OF COMMISSIONERS
OF THE
SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA;
FOR 1876.

*To the Honorable the Senate and House of Representatives of Penn-
sylvania:*

The Board of Commissioners of the Second Geological Survey of Pennsylvania respectfully present the following Report:

The plan of the Survey adopted in 1874 has been pursued without important changes; except that, as the members of the corps grew more familiar with their respective fields, it became, in some instances, practicable to divide the parties, and thus to virtually increase the working force. At all times, every man has been engaged that the limit of our appropriation would allow.

The party in the Great Valley, beginning at Easton, has nearly finished Northampton and Lehigh counties, and will probably reach the Schuylkill during the coming season. The extreme difficulty of this field has caused less rapid progress to be made than was expected.

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The Survey of York and Adams counties has extended itself into Franklin and Cumberland, and will require at least another season.

The party engaged in the Juniata Valley has been divided: one member of it devoting himself to the outcrops of the fossil ores, and having traced and described four or five hundred miles of such outcrops in Union, Snyder, Juniata, Mifflin, Perry, Huntingdon and Fulton counties. The other members were employed for a time on a Survey of the Aughwick Valley, and from that to Broad Top Mountain, and subsequently were again separated: one member being occupied with a detailed map of the Standing Stone Mountain and Seven Mountains in Huntingdon and Centre counties, and the other in the coal-fields of McKean county.

The Survey and map of Morrison's Cove, Canoe, Sinking and Scotch Valleys, in Blair, Bedford and Huntingdon counties, (a most elaborate and accurate work,) is finished and ready for publication. If the means at our command should permit, this will be extended westward to the Allegheny Mountains, and north-eastward, through Spruce Creek, Warrior's Mark, Nittany, Brush and Penn's Valleys, beyond Bellefonte, to the neighborhood of Lock Haven. As it is, however, it is a specimen of what should be done throughout the State.

The work in the Bituminous Coal-field, which commenced in Clearfield county, in 1874, and a Report of which has been published, has now been extended through Centre, Jefferson, Cambria and Somerset, and into Indiana and Armstrong.

The Survey of Greene and Washington counties has been completed and the Report is published. A special feature of this Report, and a novelty in Geology, is a map indicating the depth of the Pittsburg and Waynesburg seams of coal at nearly every cross-road in the counties.

The Report for 1876 will include the outlying patches of the Pittsburg Seam in Indiana county, in the Ligonier Valley, and in the Salisbury Coal Basin of Somerset.

Fayette and Westmoreland counties are nearly finished, and the county maps can be colored to represent the geological formations; though, in the absence of an exact topographical survey, perfect accuracy in the outcrops is not to be expected.

The lower coal measures of Beaver, Butler, Lawrence and Mercer counties have been surveyed, and a connection thus made between the upper coal series of the south-western portion of the State and the Survey of the Oil Region.

The Oil Region (one of the most difficult as well as the most important in the State) has this year been occupied by three parties: one, in the south, working up from the Pittsburg Coal-field; one, in the north, working down from the Coal-field of McKean and Potter; and one, in the heart of the Oil Region. The principal difficulty in this part of the Survey is, to identify the oil-bearing sand rocks, and to harmonize the general theory of the structure with that of Ohio. By using observations in Ohio and New York as checks of our results, there is no doubt that all the important points of the geology will be made out. Meantime, the work has been vigorously pushed, and every accessible source of information has been sought, in order to solve the grand question, Is there any law governing the location of oil territory?

The Report on the rocks below the coal in Bradford and Tioga counties is ready for the printer, and is only waiting for the illustrations.

Potter county has been surveyed this year.

The work of the Laboratory, by the arduous labor of the State Chemist, has been kept fully abreast of the Survey, and, besides this, the Laboratory has been able to analyse specimens brought in almost daily, by persons whose curiosity or expectations of profit were excited by them.

Besides the regular analysis of minerals, the Board have authorized a special analysis of oils and natural gases from oil wells. This work has never been undertaken before in a systematic geological manner, and, so far, the results have justified the expenditure.

The following is a statement showing (A) the counties surveyed and practically finished; (B) counties partially surveyed; (C) counties not yet commenced.

A	B	C
Adams,	*Allegheny,	Bedford,
Bradford,	*Armstrong,	†Bucks,
Cambria,	*Beaver,	*Cameron,
Clearfield,	Berks,	Carbon,
Fayette,	Blair,	†Chester,
Greene,	Butler,	Columbia,
Jefferson,	Centre,	†Dauphin,
Potter,	Clarion,	†Delaware,
Somerset,	Clinton,	*Elk,
Tioga,	*Crawford,	*Erie,
Washington,	Cumberland,	*Forest,
Westmoreland,	Franklin,	†Lebanon,
York.	Fulton,	Luzerne,
13	Huntingdon,	Monroe,
	*Indiana,	†Montgomery,
	*Juniata,	Montour,
	Lancaster,	Northumberland,
	*Lawrence,	Philadelphia,
	Lehigh,	Pike,
	*Lycoming,	Schuylkill,
	*McKean,	Snyder,
	*Mercer,	*Sullivan,
	Mifflin,	Susquehanna,
	Northampton,	Wayne,
	*Perry,	Wyoming.
	*Union,	25
	*Venango,	
	*Warren.	28

It will be observed that two of the most important parts of the State (the Anthracite Coal Region and the South-eastern part of the State—the District embracing the Azoic rocks and New Red Sandstone) have not been touched. The reasons for

* Counties to be completed in 1877.

† Counties to be partially surveyed in 1877.

leaving these Districts to the last, were, first, that the Anthracite Region was well surveyed by the first Survey, and has been more thoroughly explored since than any other portion of the State; second, that the South-east, while it is one of the most important, scientifically as well as economically, is also the most difficult District in the State, and, for that reason, has been postponed till a late period in the Survey.

The field-work is not all, nor even the most important part, of the Survey. To prepare the results of field-work for publication, a large amount of office-work is necessary. The experience of the past shows that seven months of field-work require five months of office-work; and our practice is to send out the parties about the first of May and to call them in about the first of December. It takes the whole time, from December to May, for them to prepare their Reports with the maps and illustrations. By this means only can the plan of immediately publishing the results be successfully pursued. It is believed that we have thus been enabled to print the Reports with unexampled promptness, notwithstanding the unavoidable delays which have occurred in the preparation of the plates and illustrations.

The following is a list of the Reports which have been published:

- A. Professor Lesley's Preliminary Report; Part I.
- B. Dr. Genth's Reports on Mineralogy; two volumes.
- C. Professor Frazer's First Report on York and Adams Counties.
- D. Professor Prime's Report on parts of Lehigh and Northampton Counties.
- H. Mr. Platt's First Report on the Bituminous Coal-Fields, embracing Clearfield, Centre and Jefferson Counties.
- I. Mr. Carll's First Report on the Oil Regions.
- J. Mr. Wrigley's Report on Petroleum.
- K. Mr. Stevenson's Report on Greene and Washington Counties.
- M. Mr. McCreath's Report of Analyses.

The following are in the hands of the printer, in various stages of progress:

Report on Coke.

Sherwood's Report on the Northern District. This Report is confined exclusively to the rocks below the coal, in Bradford and Tioga Counties. The coal basins of the northern tier of counties will be treated in a second volume, the materials for which are already, in great part, collected.

Frazer's Second Report on York and Adams, with parts of Franklin and Cumberland Counties.

Platt's Second Report on the Bituminous Coal-Field, embracing Cambria, Somerset and parts of Indiana and Armstrong Counties.

The following are now undergoing revision by the Chief Geologist, and will soon be ready for the printer:

Dewees' Report on the Fossil Ore Outcrops.

Allen's List of Levels.

Chance's Report on the Water Gaps.

The following are in preparation:

Dr. Hunt's Report on the Trap Formation.

Professor Lesquereaux' Report on the Coal Fossils.

Billen and Ashburner's Report on part of Huntingdon County.

Reports of the field-work of the past season (1876) will be prepared for publication this winter, and will be published in 1877.

The Act creating the Survey prescribes that copies of the Reports and maps shall be donated to every college and public library in the State, and shall be furnished at cost of publication to all other applicants for them. As a mode of distributing the books to the general public, this has been a perfect failure. The Board have no funds to spare for advertising the books, and the people do not know where to procure them, nor even that they are issued.

Eleven thousand five hundred copies were printed of the first seven Reports, taken together. Of these, 2207 have been distributed to parties entitled under the Act and 864 copies have been sold. It is, therefore, recommended that the Act be modified, so as to permit copies to be sold to booksellers at the usual trade discount. This would interest a large class in the distribution of the books, and they would be brought effectually before the public. It is also recommended that a certain number of copies be allotted to the Board for gratuitous distribution. The members of the corps are constantly in receipt of assistance and information from persons who would not accept pecuniary compensation, but would consider themselves amply paid by a copy of the Reports. In such cases, the practice has been to purchase copies of the Reports, present them to the persons and charge them to the expenses of the Survey. So, too, the Board are directed by the Act to collect Reports and Maps of the Surveys of other States. In many cases these can only be procured by exchanging our own Reports for them. In the above cases, and in others which occur from time to time, it would be greatly to the advantage of the Survey if the Board were allowed a limited number of copies for gratuitous distribution.

It is further recommended, that the author of each Report be allowed fifty copies of such Report for his own use.

But the purpose of the Survey will not be subserved, if the published results are not brought within the reach of the people as far as possible. It is, therefore, recommended that the Legislature order a moderate number of additional copies to be printed for the use of the members from the stereotype plates belonging to the Survey.

The collection of specimens has been going on steadily since the commencement of the Survey, and is now becoming unmanageable. The recommendation in our last Report is here repeated, that some place be provided for the display of the collection, which is now mostly hid away in boxes and wholly useless, instead of being a source of instruction to the people.

The United States Coast Survey authorities have shown every disposition to aid the Geological Survey of the State, as far as their limited means will permit, by establishing stations for the determination of a large number of fixed points, from which an accurate map of the State can afterwards be constructed. The number of stations which the Coast Survey can occupy depends solely upon the amount of money appropriated; and in several of the States the meagre pittance allowed by the General Government has been supplemented by moderate State appropriations, which have doubled the rate of progress of the work. Unless State aid is afforded, it will require a long time (twenty years, perhaps) for the Coast Survey to complete the triangulation of the State. It is recommended that an appropriation of three thousand dollars be made, to be expended by the United States Coast Survey, and perhaps by the Survey of the Lakes, in establishing stations within the State.

The most important question for the Legislature to decide, is, whether the Survey is to continue, or to break off incomplete at the end of the present year. The annual appropriation of fifty thousand dollars is, perhaps, as much as can be properly expended, and, if continued for three, or perhaps four, years, will complete the Survey on its present plan. It rests with the Legislature to decide if this shall be done. The Board of Commissioners are convinced that the results obtained will justify the expenditure in the minds of the people.

The organization of the Survey is such, that it is necessary to know a year in advance what to expect. If, for instance, the Legislature decide to refuse the appropriation for 1878, it will be our duty to stop all field-work for 1877 by the end of August, call in the parties and set them at office-work, to prepare their Reports and illustrations. This, of course, would reduce the amount of work as above laid out, and the condition of the Survey when thus wound up would be this:

COUNTIES PARTIALLY SURVEYED.

Berks,
 Blair,
 Bucks,
 Butler,
 Centre,
 Clarion,
 Clinton,
 Cumberland,
 Franklin,
 Fulton,
 Huntingdon,
 Lancaster,
 Lehigh,
 Mifflin,
 Northampton,
 Chester,
 Dauphin,
 Delaware,
 Lebanon,
 Montgomery,
 Philadelphia.

(21 Counties.)

COUNTIES NOT TOUCHED.

Bedford,
 Carbon,
 Columbia,
 Luzerne,
 Monroe,
 Montour,
 Northumberland,
 Pike,
 Schuylkill,
 Snyder,
 Susquehanna,
 Wayne,
 Wyoming.
 (13 Counties.)

It is not believed that the Legislature will consent to abandon the Survey in this unfinished state, and postpone, perhaps for years, the completion of a work of such magnitude and importance.

The Board, therefore, recommend an appropriation of fifty thousand dollars for each of the years 1878 and 1879, for the continuance of the Survey.

To recapitulate:—The Board recommend such modifications of the Act relating to the distribution of the Reports as will, in their opinion, tend to the benefit of the Survey and to the dissemination of the information contained in them among the people of the State.

They recommend, further: that some provision be made for the display of the geological specimens collected by the Survey:

And that an appropriation of three thousand dollars be made, to be expended by the United States Coast Survey in establishing stations within the State:

And that an appropriation of fifty thousand dollars be made, for the work of the Survey, for each of the years 1878 and 1879.

Respectfully submitted,

JOHN F. HARTRANFT, *Chairman, ex officio.*

ARIO PARDEE,
WILLIAM A. INGHAM,
HENRY S. ECKERT,
HENRY McCORMICK,
JAMES MACFARLANE,

JOHN B. PEARSE,
ROBERT V. WILSON, M.D.
DANIEL J. MORRELL,
HENRY W. OLIVER, JR.
SAMUEL Q. BROWN,
Commissioners.

NOTE.—EXPLANATORY OF THE MAP.

That part colored *blue* is virtually finished; although any amount of additional work might be done upon it, if means permitted.

The parts colored *red* are intended to be surveyed and finished in 1877; *provided* the appropriation for 1878 and 1879 is granted. If not, the work to be done in 1877 will have to be cut down, as mentioned in the Report, pages 8 and 9.

The central part of the Oil Region is left *white*, because it is still unfinished; and a certain amount of work will be required in it every year during the continuance of the Survey.

The letters in the *blue* portion indicate the Reports already published, or in preparation, relating to the Districts thus marked.

MAP OF PENNSYLVANIA, SHOWING THE AREAS SURVEYED IN 1874, 1875 & 1876 IN BLUE.
AND THE AREAS TO BE SURVEYED IN 1877 IN RED.



